

## Engineering Concept Design &amp; Assembly in VR Program

Completed Technology Project (2016 - 2019)



## Project Introduction

This multi-year IRAD proposal, in a strategic partnership with University of Maryland (UMD) and Bowie State University (BSU), creates a collaborative virtual reality (VR) tool for concept design and assembly in VR from a database of pre-defined "parts", enabling engineers and scientists to work in a shared VR environment, as part of a concept design or pre-phase A proposal process. The proposal will define a domain agnostic database for specifying a set of physical, off-the-shelf, plug and play parts with reduced detail shape/CAD files and migrate existing domain-specific GSFC database(s) to this format, to quickly realize a collaborative, model-based VR engineering environment for prototyping, assembly mockup, and visualizations for pre-phase A work.

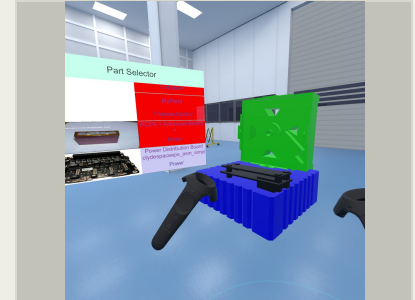
This proposal will create a collaborative VR environment for early stage design and assembly of hardware projects from pre-defined, off-the-shelf parts as part of a concept design or pre-phase A proposal process. The project will:

- Create a database of metadata about parts
- Create a collaborative VR environment where users
  - Visualize a complete project design composed of off-the-shelf parts at real-world scales (or user-selected scales) and at any orientation
  - View and select off the shelf parts, and drag-and-drop them into a design
  - Layout and orient parts including alignment and mounting holes
  - Use virtual tools to determine tool paths and whether the model can be assembled in the real world without expensive manufacturing, physical prototypes or 3D printing
- Export projects as documents with assembly information and pictures at a level appropriate for pre-phase A proposals

The VR environment can also help the downstream process with communication and planning between scientists and engineers in the Mission Design Lab (MDL) or for educational outreach. The first year will culminate in an alpha app for mechanical engineers for concept design and assembly mockups.

## Anticipated Benefits

This project enables easier pre-Phase A proposal process development in engineering concept design and assembly by allowing quick assembly and prototyping of a design in VR. The project allows users to visualize a complete project design composed of off-the-shelf parts at real-world scales (or user-selected scales) and at any orientation. It also allows the user to use virtual tools (such as screwdrivers and wrenches) to determine tool paths and



Assembly VR Screenshot

## Table of Contents

Project Introduction	1
Anticipated Benefits	1
Primary U.S. Work Locations and Key Partners	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Images	3
Technology Areas	3
Target Destination	3

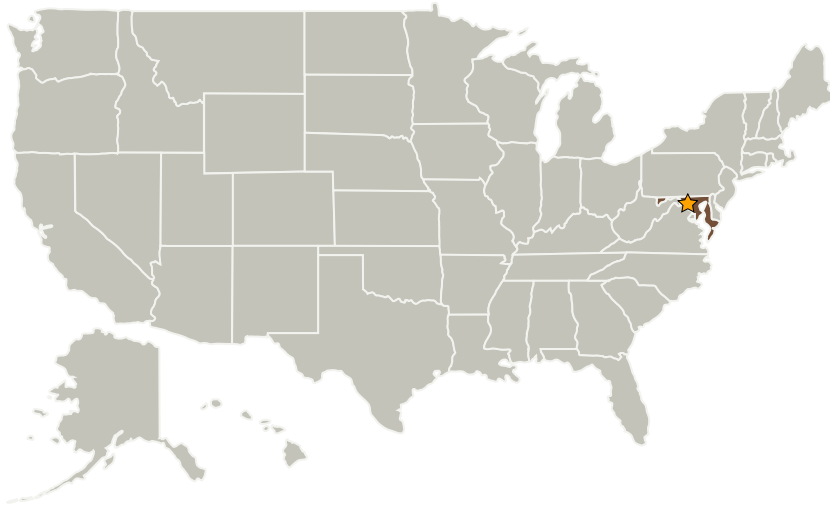
## Engineering Concept Design &amp; Assembly in VR Program

Completed Technology Project (2016 - 2019)



whether the model can be assembled in the real world without expensive manufacturing, physical prototypes or 3D printing.

## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Goddard Space Flight Center (GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland

Co-Funding Partners	Type	Location
Bowie State University (BSU)	Academia Historically Black Colleges and Universities (HBCU)	Bowie, Maryland
University of Maryland-College Park (UMCP)	Academia Asian American Native American Pacific Islander (AANAPISI)	College Park, Maryland

## Primary U.S. Work Locations

Maryland

## Organizational Responsibility

## Responsible Mission Directorate:

Mission Support Directorate (MSD)

## Lead Center / Facility:

Goddard Space Flight Center (GSFC)

## Responsible Program:

Center Independent Research &amp; Development: GSFC IRAD

## Project Management

## Program Manager:

Peter M Hughes

## Project Managers:

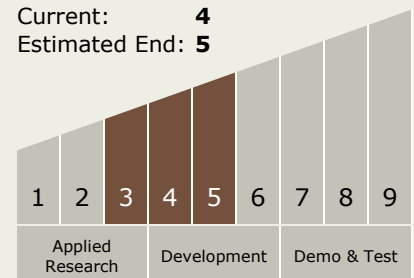
Jacqueline J Le Moigne-stewart  
Michael A Johnson

## Principal Investigator:

Thomas G Grubb

## Technology Maturity (TRL)

Start: **3**  
 Current: **4**  
 Estimated End: **5**

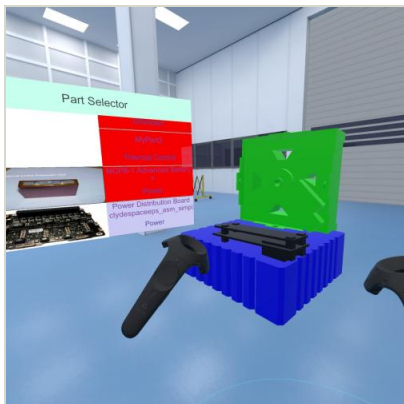


# Engineering Concept Design & Assembly in VR Program

Completed Technology Project (2016 - 2019)



## Images



### Assembly VR Screenshot

Assembly VR Screenshot  
(<https://techport.nasa.gov/image/34339>)

## Technology Areas

### Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
  - └ TX11.4 Information Processing
    - └ TX11.4.4 Collaborative Science and Engineering

## Target Destination

Foundational Knowledge